

# MAMMALIAN FAUNA FROM AN ARCHAIC SITE ON MOTUTAPU ISLAND, NEW ZEALAND

IAN W.G. SMITH

UNIVERSITY OF OTAGO

*Abstract.* Mammalian fauna from the Pig Bay site (N38/21) on Motutapu Island, most of which dates from the 14th to 17th centuries A.D. is described. The range of species identified is narrower than that observed in contemporary sites from adjacent areas, and dogs appear to have formed a significant part of the diet throughout the occupational sequence. Patterns of tooth wear in dogs show similarities with other Archaic North Island sites, and the observed butchering patterns suggest exchange or sharing of dog carcasses.

Archaeological evidence of early Polynesian occupation in the Auckland area is rare. Material belonging to this period has been recovered from four coastal middens — the Sunde site (N38/24) and Pig Bay (N38/21) on Motutapu Island, a midden (N43/1) on Ponui Island, and the Wattle Bay site (N46-47/16) just inside the entrance to the Manukau Harbour — and two inland living sites at Wiri Mountain (N42/24) and Mount Wellington (N42/4) (Davidson 1978:2-4). Although not all precisely dated, the Archaic levels of these sites appear to lie within the period A.D. 1350 - 1500 (*ibid*). The lowest levels of the Sunde site, sealed below ash from the eruption of Rangitoto, comprise the earliest dated occupational evidence from the region. This occupation occurred immediately prior to the eruption which is dated to the 14th or early 15th century (Law 1975). With the possible exception of Wiri Mountain and Wattle Bay, the remaining material postdates the ash shower, and radiocarbon dates from the Sunde site (Davidson 1974:9) and Pig Bay (Brothers & Golson 1959:571) suggest continuation of the Archaic into the 16th century.

Understanding of the economic activities during this period is limited to published accounts from two sites. Evidence for probable field systems associated with a living terrace at Wiri Mountain has been discussed by Sullivan (1975), and Scott (1970) has analysed a small faunal sample from the Sunde site. The largest faunal sample from any Auckland Archaic site is that from Pig Bay, and in this paper an attempt will be made to further our understanding of economic activities through a detailed analysis of the mammalian component of that fauna. This material derives from excavations directed by Golson in 1958 (Golson 1959, Golson & Brothers 1959, Brothers & Golson 1959) and is now housed in the Auckland Museum.

## *The site*

The Pig Bay site is located adjacent to a stream behind the beach in the western part of Administration Bay on Motutapu Island. Excavations revealed cultural material lying beneath recent dune sand and above a thick band of Rangitoto ash (Golson 1959, Golson & Brothers 1959, Brothers & Golson 1959). The cultural material was deposited within

three types of strata, here termed lower, middle and upper. The lower stratum, immediately above the primary deposit of Rangitoto ash, was composed of wind blown ash and beach sand up to 1 m in depth, indicating a period of post-eruption dune building. Sparse cultural material was located in the upper 45 cm. Above these dunes the middle stratum contained layers of dense midden and a wide variety of artefactual and occupational debris, stratified between lenses of water laid ash. During this period the site appears to have been on the margins of a lagoon which was formed when the ash-laden dunes dammed the stream. The interspersed ash lenses represent periods of flooding of the site (Brothers & Golson 1959:575). The upper stratum was composed of wind blown sand with none of the water borne ash component, indicating that by this time the dune barrier had been breached and the site was no longer on the edge of a lagoon. Occupational evidence in the upper stratum was sparse, with only "a few thin middens of shell and fishbone with virtually no associated material culture" (*ibid.*).

Within these three broad strata, and in particular the middle stratum, stratigraphy was complex and not easily amenable to reconstruction. The earliest occupation of the site appears to have occurred during the post-eruption dune building phase. The sparse nature of the cultural material and in particular the limited quantity of faunal material indicate that this occupation is likely to have been brief and transitory.

The middle stratum was greatly disturbed by the digging of fire scoops, but in at least one part of the excavated area there were "up to six levels of occupation sealed for the most part between layers of water-laid reworked basaltic ash" (*ibid.*). Correlation of these levels with the 19 layers and subdivisions of layers from which the faunal material in the middle stratum derive is complicated by twenty years of attrition on the available stratigraphic information. However, five occupation levels have been defined through analysis of the material in hand. The bulk of the faunal material was contained in five layers which were separated, for the most part, by layers with little or no faunal material. In the following analysis material from layers adjacent to the major occupation layers have been pooled in the manner outlined in Table 1.

Table 1. Occupation levels at Pig Bay.

Stratum	level	major occupation layer	pooled stratigraphic layers
upper	I	6	1,3,4,5,5a,5b,5c,6,
	II	7	7a,7b
middle	III	8	8a,8b,8c,8d
	IV	10	9,10,10a,11
	V	13	12,13,13b,13c,14
	VI	15	15a,15b,15c
lower	VII	16	16

The upper stratum was composed of nine layers and subdivisions of layers which have been combined into a single occupation level.

Accurate dating of the occupation levels is not possible, but levels II to VII which contain the bulk of the faunal material must lie between the 14th and 17th centuries. The earliest occupation, level VII, postdates the Rangitoto ash shower of the 14th or early 15th century. Charcoal from a hangi cut from the base of level I has been dated to A.D.  $1678 \pm 40$  (N.Z.221, *ibid.*:571). The presence of an iron file midway through level I (*ibid.*:576) and cattle bones at its base indicate either a relatively late date for this level or post-European disturbance.

#### *Methods of analysis*

Although some of the faunal material had been sorted and identified previously a complete reassessment of the mammalian bone was undertaken. All faunal material was examined, mammalian bone extracted and sorted into dog and sea mammal. Identification to species level, where possible, was undertaken by comparison with specimens housed in the Anthropology Department, University of Otago. The fragmentary nature of much of the cetacean material and inadequacies in the reference sample prevented species identification in some cases.

The minimum numbers of individuals (MNI) represented by each skeletal element were derived from the most frequently occurring portion of that element. The proportional representation of body parts was calculated from this data. The maximum MNI for each species within each occupation level was calculated from the most frequently occurring skeletal element.

Dogs were aged on the basis of epiphyseal fusion and tooth eruption using procedures outlined by Allo (1970, 1971). Tooth wear and dental abnormalities (*ibid.*) were also assessed. The fragmentary nature of the sea mammal bone prevented any analysis beyond computation of MNI.

#### *Results*

The MNI represented in each occupation level are shown in Table 2. Two securely identified species are present; the Polynesian dog, *Canis familiaris*, and the Pilot whale, *Globicephala melaena*. The cetacean bones in levels I and V could not be identified to species, although they are within the size range of the Pilot whale. All of the cetacean bone was in poor condition and only in level VI were more than a few fragments present. The possibility that at least some of the cetacean material in levels I to V derives

Table 2. Minimum numbers of individuals.

Level	dog	pilot whale	cetacean ?sp.	total
I	3		1	4
II	5			5
III	3	1		4
IV	5			5
V	4		1	5
VI	8	1		9
VII	1			1
Total	29	2	2	33



from level VI must be considered. Internal disturbance within the site through the digging of firescoops could account for this. The frequent use of sea mammal bone for artefact manufacture in all levels (Appendix 1) raises the possibility of deliberate mining of earlier occupation levels for suitable bone. Alternatively, industrial bone could have been acquired from the skeletons of naturally stranded animals. Thus the presence of cetaceans in all levels does not necessarily indicate that they were always a source of food at this site.

The same cannot be said for the dogs. Consideration of the proportional representation of skeletal elements (Figs. 1-6) indicates that all body parts were present at all levels, except level VII, which contained only a few teeth and a single vertebra. The relatively small numbers of individuals, and, perhaps more importantly, the numbers of identified elements in each level limit the confidence which can be placed in conclusions about butchering patterns drawn from this data. Furthermore, differential bone survival (cf. Binford & Bertram 1977) and incomplete excavation of the site may have unequally affected the observed pattern of body parts representation. Nevertheless one feature of these assemblages is worthy of closer analysis: the body parts which might be expected to make up the best cuts of meat are under-represented in most levels.

Quantitative data on the amount of meat provided by each body part is not available for the Polynesian dog, nor do we know the procedure generally employed in prehistoric New Zealand for butchering these animals. A brief consideration of typical canine myology (Miller *et al.* 1964: Chapter 3) suggests that the three best cuts would be taken from the upper hindlimbs, the upper forelimbs and from the musculature along the dorsal surface of the vertebral column. The first two of these would be most easily obtained by detaching the meat on the bone. In the case of the hindlimbs, both right and left sides may have been taken as a single cut along with the pelvis and sacral vertebrae, or alternatively as two separate units with the rump and sublumbar muscles flensed from the pelvis and each limb disarticulated from the axial skeleton at the hip joint. The forelimbs would be easily removed by detaching the scapulae and associated musculature from the thorax.

Detaching the dorsal musculature of the trunk on the bone would be a difficult and laborious task, involving disarticulation of the cranium and ribs from the vertebral column. A more likely procedure, which would yield the bulk of this meat, involves simply flensing the musculature from the neck and back. Once these three cuts had been taken the remainder of the skeleton would provide little meat.

With these considerations in mind, analysis of the representation of body parts in Pig Bay reveals an interesting pattern. All body parts are represented in each level (excluding level VII, which yielded only four identified elements), which indicates that butchering of the dogs took place at the site. The head is the most common body part, providing the maximum MNI in all but one assemblage. Limb bones tend to be under-represented, except in levels I and V, and the trunk of the body varies in its observed presence. Differential bone survival may account for the variable representation of the trunk, as ribs and to a lesser extent vertebrae are difficult to identify in the fragmentary condition in which they usually occur in archaeological sites. However this is an unlikely explanation for the low occurrence of limb bones, as these survive as well as do cranial bones. Allo (1970) has noted that dog limb bones tend to be under-represented in New Zealand archaeological sites, and has suggested industrial use of these bones as a cause. Artefacts



of dog limb bones have been recovered from several sites (e.g. Duff 1956:95, Boileau 1980:72). However there is little direct evidence for industrial use of limb bones at Pig Bay, either in the form of finished artefacts or cut and discarded sections of bone (Appendix 1), and an alternative explanation for their low representation is considered more likely. It is suggested that once these body parts had been detached from the carcass they were frequently taken elsewhere for consumption. Clearly this did not happen all the time as limb bones are present in all assemblages, nevertheless the observed pattern of body parts representation would seem to indicate the sharing of dog carcasses. There is insufficient evidence to determine whether parts of the carcass were simply removed to another part of the same site or taken farther afield before being consumed.

The ages at death of the dogs were assessed by the methods outlined by Allo (1970). Table 3 presents the results of this analysis. Only 55% of the identified individuals were able to be aged as the major limb bones, essential for establishing age by epiphyseal fusion, were frequently not present. The more frequently represented mandibles are useful for accurate ageing only up to the completion of tooth eruption at about seven months. This has prohibited any meaningful interpretation of patterns in the age at death of dogs in this site.

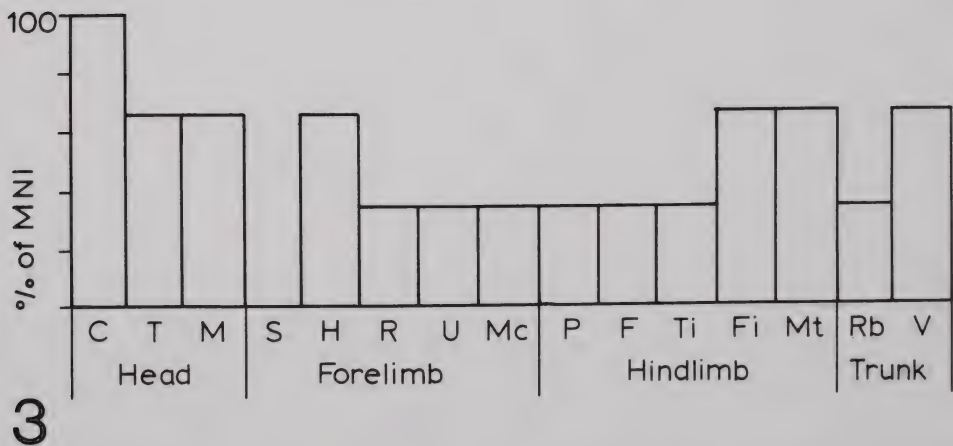
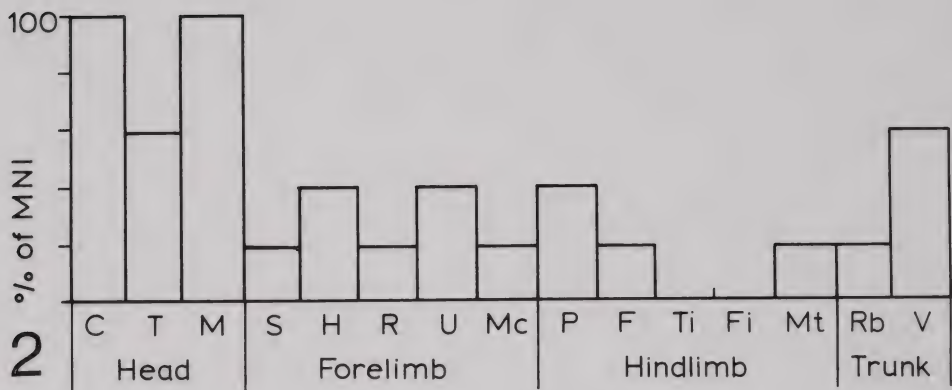
The degree of tooth wear, measured on a scale from zero to five (Allo 1971:37) is summarised in Table 4. These results are similar to those obtained by Allo for the North Island Archaic sites of Houhora (N6/4) and Whangamata (N49/2) (*ibid.*:Table 4). The

Table 3. Ages of dogs at death.

Level	juvenile <7 months	subadult 7-18 mths	adult >18 mths	no indication	total
I	1		1	1	3
II	2	1	1	1	5
III			1	2	3
IV			1	4	5
V		2		2	4
VI	2	2	2	2	8
VII				1	1
Total	5	5	6	13	29

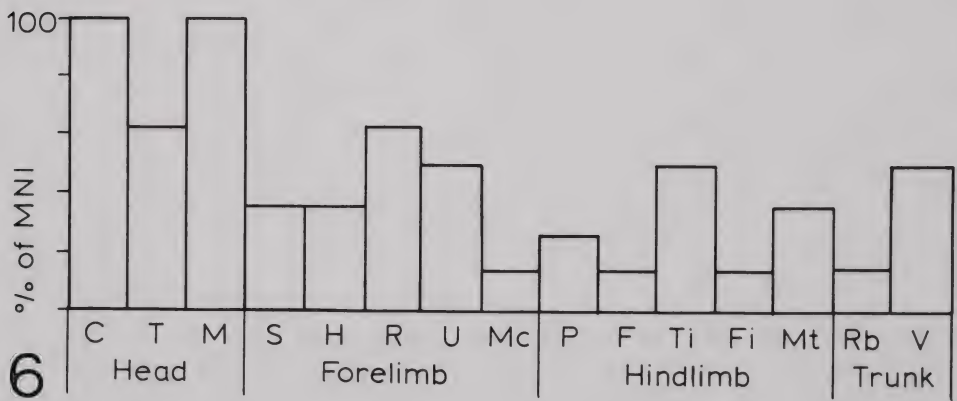
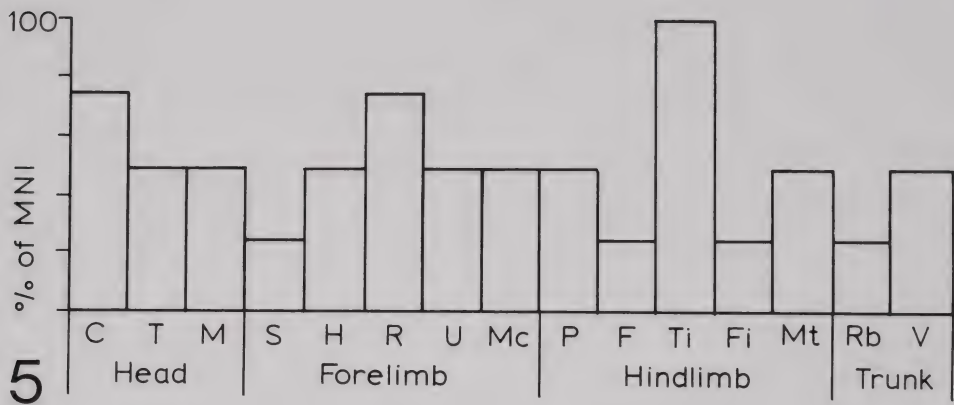
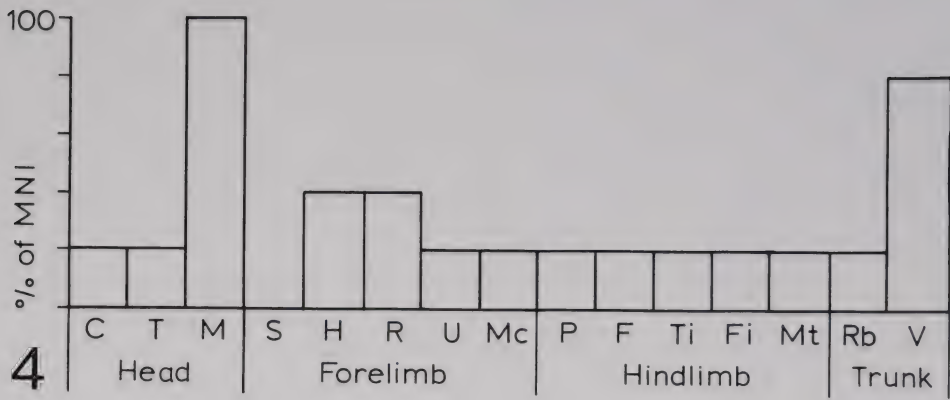
Table 4. Tooth wear in dogs.

Level	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
I				2						
II		1		1	1		1			
III					1	1				
IV					2	1				
V				1			1			
VI	2		1	2		1	1	1		
Total	2	1	1	6	4	3	3	1	0	0



Figs. 1-3. Proportional representation of dog body parts. 1. Pig Bay level I. Maximum MNI = 3. Number of identified elements = 62. 2. Pig Bay, level II. Maximum MNI = 5. Number of identified elements = 89. 3. Pig Bay level III. Maximum MNI = 3. Number of identified elements = 86.

C—cranium, T—teeth, M—mandible, S—scapula, H—humerus, R—radius, U—ulna, Mc—metacarpus, P—pelvis, F—femur, Ti—tibia, Fi—fibula, Mt—metatarsus, Rb—rib, V—vertebra.



Figs. 4-6. Proportional representation of dog body parts. 4. Pig Bay level IV. Maximum MNI = 5. Number of identified elements = 40. 5. Pig Bay level V. Maximum MNI = 4. Number of identified elements = 83. 6. Pig Bay level VI. Maximum MNI = 8. Number of identified elements = 130.



range of wear ratings, from 0.5 to 4.0, is identical, with the bulk of the specimens in each case falling in the middle of this range. The Pig Bay results corroborate Allo's finding that extreme wear is not observed in North Island sites.

Seven incidences of dental abnormalities were observed (Table 5). All of these were found in the mandibular dentition. The most commonly occurring abnormalities in Allo's study, supernumerary alveoli, were not observed at Pig Bay. The two examples of single rooted premolars are matched in Allo's study by a single example of each; one from Houhora, and one from Whangamata. Absence of the third mandibular molar has not been observed previously in North Island sites. Premortem tooth loss appears to have been rare, and more frequent in South Island sites (*ibid.*:38). Recession of the alveolar bone due to periodontal disease has been recorded previously only in the South Island. The two examples in Pig Bay both involved considerable alveolar recession and premortem tooth loss and were clearly the result of periodontal disease.

Table 5. Dental abnormalities in dog mandibles.

Level	single rooted premolar P3	P4	absence M3	premortem tooth loss	recession of alveolar bone
I	1				
II			1	1 (P2)	
III		1			
IV				1 (P2)	
VI				2 (M1, P4)*	2

\* tooth loss due to periodontal disease

### Discussion

Until analysis of the non-mammalian fauna from Pig Bay has been completed it is not possible to fully understand the patterns of resource utilisation and economic activity at the site. However the present analysis does permit some tentative conclusions to be drawn. Firstly, dogs were a major food source throughout the occupation of the site. They occur in all levels, and only in the earliest occupation are fewer than three individuals represented. With the exception of cetaceans, whose remains are few and may not necessarily result from exploitation for food, they comprise the whole of the mammalian fauna. Fur seals and sea lions are absent, and moa bone is rare and probably industrial (Davidson pers. comm.). The remaining fauna includes fish, shellfish and birds. Thus dogs are the largest animals occurring in the midden and are likely to have made up a significant proportion of the diet. An identical pattern has been observed in contemporary levels of the Sunde site, where dogs were the only mammal, moas were not exploited for food, and a similar range of species made up the remainder of the fauna (Scott 1970).

The absence of seals is one of the most striking features of this site when compared to assemblages from adjacent coastal areas. In contemporary middens on the Coromandel (e.g. Allo.1972, Smith 1978, 1981) fur seals occur regularly, sometimes in equal numbers to dogs, and generally they contribute a greater weight of meat than do dogs. The somewhat earlier site of Houhora in Northland also contains large numbers of fur seals (Shawcross 1972, Smith n.d.). The presence of both fur seals (Scott 1970) and sea lions

(Smith n.d.) beneath the Rangitoto ash in the Sunde site indicates that both these species were present and exploited in the Hauraki Gulf prior to the 14th or 15th century. Their absence in later sites may indicate localised extinction, or alternatively that the sites were occupied at a time of year during which seals were not present in the area. At present there is insufficient evidence to properly evaluate these two hypotheses.

There is a suggestion in the Pig Bay evidence that the exploitation of dogs may have declined through time. The greatest number of individuals occur in level VI. In the succeeding levels numbers fluctuate, but never reach the proportions observed earlier. A similar pattern of declining numbers through time is apparent in the Sunde site (Scott 1970), although the extent to which this indicates reduced exploitation rather than reflecting the general decline in quantity of faunal material cannot be ascertained.

Perhaps the most revealing results of this study concern the dog butchering patterns. It was argued above that the proportional representation of body parts observed in most levels of Pig Bay indicated the sharing of butchered dog carcasses. Archaeological evidence for this practice has not previously been recorded in New Zealand.

Documentary evidence of dog butchering and the sharing of carcasses in the protohistoric period is rare. George Forster (in Titcomb 1969:42) mentions eating roasted leg of dog, which provides some confirmation of the suggested method of butchering, and Beattie (1939:130) refers to dog carcasses as an item of exchange although he does not indicate whether they were whole or butchered. The absence of detailed accounts of dog butchering and sharing and their social corollaries in the protohistoric, and the time difference between the pre- and protohistoric periods make it difficult to determine the cultural importance of the Pig Bay evidence. Nevertheless it is reasonable to assume that the evident distribution of butchered dog carcasses indicates a social relationship mediated by food sharing or exchange between the people at Pig Bay and some others. Elucidation of the nature of this relationship and its cultural importance must await further evidence.

### *Conclusion*

The mammalian fauna from Pig Bay is remarkably limited in range of species when compared to contemporary coastal sites in New Zealand. The reliance on sea mammal hunting as well as moa hunting observed in so many coastal Archaic sites is absent here, suggesting a somewhat different economic adaptation in this region. Although the non-mammalian fauna has not yet been analysed it would appear that the food quest centred around fishing and shellfishing. Horticulture may well have played an important role in the economy. Throughout the occupation of the site dogs were an important dietary component. The apparent scarcity of other mammalian food resources may have accounted for the sharing of butchered dog carcasses observed in the site.

*Acknowledgements.* I am indebted to Janet Davidson, then Archaeologist at the Auckland Museum, who made this material available for study, provided invaluable background information and commented on the manuscript, and Roger Fyfe (Taranaki Museum) for discussions on butchering methods.

## APPENDIX 1: WORKED BONE FROM PIG BAY

Acc.No.	Layer	Level	Description	Identification
2038	4	I	fish hook lure (broken)	sea mammal ?sp.
2052	5b	I	fish hook lure	sea mammal ?sp.
2042	7a	II	fish hook lure	sea mammal ?sp.
2047	8	III	fish hook (broken)	sea mammal ?sp.
2048	8	III	unfinished lure	?dog tibia
1860	8b	III	drilled tooth	fur seal
962	8b	III	fish hook tab	?moa
2053	8a/8c	III	fish hook (broken)	sea mammal ?sp.
2033	8c	III	barbed bone point	dog tibia
2035	8c	III	bone point (broken)	?dog
2043	8c	III	fish hook (broken)	sea mammal ?sp.
2044	8c	III	fish hook (broken)	cetacean ?sp.
2045	8c	III	fish hook (broken)	sea mammal ?sp.
2046	8c	III	lure (broken)	sea mammal ?sp.
2034	8disturb.	III	?	sea mammal ?sp.
2113	12	V	fish hook (broken)	sea mammal ?sp.
2114	12	V	fish hook tab	sea mammal ?sp.
2115	12	V	?	?moa
590	13	V	fish hook (broken)	sea mammal ?sp.
1662	13	V	?	cetacean ?sp.
2037	13b	V	fish hook (broken)	sea mammal ?sp.
888	13b	V	?	cetacean ?sp.
963	13c	V	?	moa
2036	13c	V	fish hook (broken)	sea mammal ?sp.
907	14	V	?	?dog
2031	14	V	needle (broken)	?bird
803	15a	VI	?	cetacean ?sp.
908	15a	VI	?	?
1841	15a	VI	?	?dog
2040	15a	VI	fish hook (broken)	sea mammal ?sp.
2041	15a	VI	fish hook tab (broken)	sea mammal ?sp.
2049	15a	VI	fish hook broken	sea mammal ?sp.
2050	15a	VI	fish hook (broken)	sea mammal ?sp.
2051	15a	VI	fish hook tab (broken)	sea mammal ?sp.
2054	15a	VI	fish hook (broken)	sea mammal ?sp.
2111	15a	VI	lure	sea mammal ?sp.
2055	15b	VI	fish hook	sea mammal ?sp.
2056	15b	VI	fish hook (broken)	sea mammal ?sp.
2112	16	VII	fish hook (broken)	sea mammal ?sp.
. . . . unprovenanced . . . . .			3 fish hooks (broken)	sea mammal ?sp.

## REFERENCES

ALLO, J.

- 1970 The Maori Dog: a study of the Polynesian Dog of New Zealand. Unpublished M.A. Thesis, University of Auckland.
- 1971 The dentition of the Maori dog of New Zealand. *Rec. Auckland Inst. Mus.* 8:29-45.
- 1972 The Whangamata Wharf site (N49/2): excavations on a Coromandel coastal midden. *Rec. Auckland Inst. Mus.* 9:61-79



- BEATTIE, J.H.  
1939 *Tikao talks: traditions and tales told by Teone Taare Tikao to Herries Beattie*. A.H. & A.W. Reed, Wellington. 163p.
- BINFORD, L.R., and J.B. BERTRAM  
1977 Bone frequencies and attritional processes. In L.R. Binford (Editor), *For Theory Building in Archaeology*. Academic Press, New York. 419p., pp.77-153.
- BOILEAU, J.  
1980 The artefact assemblage from the Opito Beach midden, N40/3, Coromandel Peninsula. *Rec. Auckland Inst. Mus.* 17: 65-95.
- BROTHERS, R.D., and J. GOLSON  
1959 Geological and archaeological interpretation of a section in Rangitoto ash on Motutapu Island, Auckland. *N.Z. J. Geol. Geophys.* 2(3): 569-577.
- DAVIDSON, J.M.  
1974 Radiocarbon dates from the Sunde site (N38/24), Motutapu Island, New Zealand. *Rec. Auckland Inst. Mus.* 11: 9-10.  
1978 Auckland prehistory: a review. *Rec. Auckland Inst. Mus.* 15: 1-14.
- DUFF, R.  
1956 *The Moa-hunter Period of Maori Culture*. 2nd ed. Government Printer, Wellington.
- GOLSON, J.  
1959 Culture change in prehistoric New Zealand. In J.D. Freeman and W.R. Geddes (Editors), *Anthropology in the South Seas . . .* Thomas Avery, New Plymouth. 267p. pp.29-74.
- GOLSON, J., and R.N. BROTHERS  
1959 Excavations at Motutapu. *N.Z. Archaeol. Ass. Newsl.* 2(2): 5-8.
- LAW, R.G.  
1975 Radiocarbon dates for Rangitoto and Motutapu, a consideration of the dating accuracy. *N.Z. J. Sci.* 18: 441-451.
- MILLER, M.E., G.C. CHRISTENSEN, and H.E. EVANS  
1964 *Anatomy of the Dog*. W.B. Saunders, Philadelphia. 941p.
- SCOTT, S.D.  
1970 Excavations at the "Sunde site", N38/24, Motutapu Island, New Zealand. *Rec. Auckland Inst. Mus.* 7: 13-30.
- SHAWCROSS, F.W.  
1972 Energy and ecology: thermodynamic models in archaeology. In D.L. Clarke (Editor), *Models in Archaeology*. Methuen, London. 1055p. pp.577-622.
- SMITH, I.W.G.  
1978 Seasonal sea mammal exploitation and butchering patterns in an Archaic site (Tairua, N44/2) on the Coromandel Peninsula. *Rec. Auckland Inst. Mus.* 15: 17-26.  
1981 Prehistoric mammalian fauna from the Coromandel Peninsula. *Rec. Auckland Inst. Mus.* 18: 107-125.  
n.d. Sea mammals and prehistoric subsistence in New Zealand. (in preparation) PhD thesis, University of Otago.
- SULLIVAN, A.  
1975 Radiocarbon ages from Wiri (N42/24). *N.Z. Archaeol. Ass. Newsl.* 18(4): 206-207.
- TITCOMB, M.  
1969 *Dog and man in the ancient Pacific*. B.P. Bishop Museum Special Publication 59.